

Characterization of polyethersulfone/cloisite 15A mixed matrix membrane for CO₂/CH₄ separation

Abstract

Asymmetric hybrid organic-inorganic clay mineral polyethersulfone (PES) flat sheet membranes were prepared from solution containing Cloisite15A® (C15A) in the mixture of solvent and polymer. Neat PES and MMM were prepared through dry/wet phase inversion method. The newly developed membranes were characterized by means of SEM. The effect of filler addition, evaporation time and coating protocol towards the performance of the membrane was investigated. The measurement was carried out at room temperature and the upstream pressure was 3 bar while the downstream pressure was atmospheric. Experimental results showed that selectivity for MMM fabricated with 0.25 wt% clay loading at evaporation time of 40 s is lower compared to those prepared at higher evaporation time. After coating with silicone rubber solution and heat treated, the resultant membranes exhibited selectivity enhancement of CO₂/CH₄ from 7.9 to 28.4 for pristine PES, while PES/C15A1 and PES/C15A2 showed a selectivity improvement of 2.29 to 18.72 and 10.24 to 33.49 each. Optimum evaporation time and appropriate coating and heat treatment have significant contribution in developing high performance MMM for gas CO₂/CH₄ separation.